

ISM4803 / ISM4803-CAN

Version 1.2

**Intelligent Servo Drive for
Step, DC, Brushless DC and
AC Motors**



T E C H N O S O F T

Intelligent Servo Drive

**Technical
Reference**

TECHNOSOFT

ISM4803 / ISM4803-CAN Technical Reference

P091.030.UM.1109

Technosoft S.A.

Buchaux 38
CH-2022 Bevaix, NE
Switzerland

Tel.: +41 (0) 32 732 5500

Fax: +41 (0) 32 732 5504

e-mail: contact@technosoftmotion.com
<http://www.technosoftmotion.com/>

Read This First

About This Manual

This book is a technical reference manual for the **ISM4803** intelligent servo drives. It describes the **ISM4803** operation and provides basic information needed by the user to program the **ISM4803** in the Technosoft Motion Language (**TML**) environment.

Notational Conventions

This document uses the following conventions:

- The Technosoft Motion Language will be referred to as TML
- TML variables, parameters or instructions are shown in special italic typeface. Here is a sample:

SETIO#4 IN;
UPD;

Information about Cautions

This book may contain cautions.



CAUTION!

**THIS IS AN EXAMPLE OF A CAUTION STATEMENT.
A CAUTION STATEMENT DESCRIBES A SITUATION THAT
COULD POTENTIALLY CAUSE HARM TO YOU, OR TO THE
ISM4803 INTELLIGENT SERVO DRIVE UNIT**

Related Documentation from Technosoft

MotionChip™ II TML Programming (part no. P091.055.MCII.TML.UM.xxxx) describes in detail TML basic concepts, motion programming, functional description of TML instructions for high level or low level motion programming, communication channels and protocols. Also give a detailed description of each TML instruction including syntax, binary code and examples.

MotionChip II Configuration Setup (part no. P091.055.MCII.STP.UM.xxxx) describes the MotionChip II operation and how to setup its registers and parameters starting from the user application data. This is a technical reference manual for all the MotionChip II registers, parameters and variables.

Help of the EasyMotion Studio software platform – describes how to use the EasyMotion Studio – the complete development platform for ISM4803 which support all new features added to revision H of firmware. It includes: motion system setup & tuning wizard, motion sequence programming wizard, testing and debugging tools like: data logging, watch, control panels, on-line viewers of TML registers, parameters and variables, etc.

Help of the IPM Motion Studio software platform – describes how to use the IPM Motion Studio – the complete development platform for ISM4803. It includes: motion system setup & tuning wizard, motion sequence programming wizard, testing and debugging tools like: data logging, watch, control panels, on-line viewers of TML registries, parameters and variables, etc.

If you Need Assistance ...

If you want to ...	Contact Technosoft at ...
Visit Technosoft online	World Wide Web: http://www.technosoftmotion.com/
Receive general information or assistance (see Note)	World Wide Web: http://www.technosoftmotion.com/ Email: contact@technosoftmotion.com
Ask questions about product operation or report suspected problems (see Note)	Fax: (41) 32 732 55 04 Email: hotline@technosoftmotion.com
Make suggestions about, or report errors in documentation (see Note)	Mail: Technosoft SA Buchaux 38 CH-2022 Bevaix, NE Switzerland

Note: You need to register your ISM4803 system, in order to get free assistance and support. Use the License No. on your Registration Card for IPM Motion Studio.

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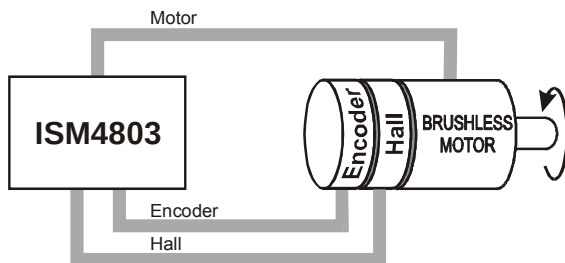
1. Key Features

- Continuous drive power: 150 W (48V, 3A)
- Logic supply: 5VDC; 600 mA
- Motor supply: 12-48V; 3A; 6A PEAK
- Motor output: 3 A RMS continuous (BLDC); 6A PEAK
- Digital Hall sensor interface (single-ended and open collector)
- Encoder interface (single-ended, open collector and differential)
- Linear Hall interface
- 4 general-purpose digital inputs
- 4 general-purpose digital outputs
- 6 dedicated digital inputs (Enable, Pulse, Dir, LSN, LSP, Auto)
- 2 dedicated digital outputs (Ready, Error)
- 2 analog inputs (REF, FDBK)
- RS-232 serial interface
- CAN-bus 2.0B interface
- 1.5K ´ 16 internal SRAM memory
- 8K ´ 16 E2ROM to store TML programs and data
- On-board thermal sensor
- HW / SW AxisID selection
- Operating ambient temperature: 0-40°C
- Hardware Protections:
 - o Short-circuit on motor phases and short-circuit to ground
 - o All I/Os are ESD protected

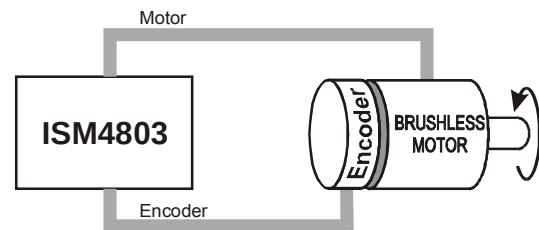
2. Supported Motor-Sensor Configurations

ISM4803 supports the following configurations:

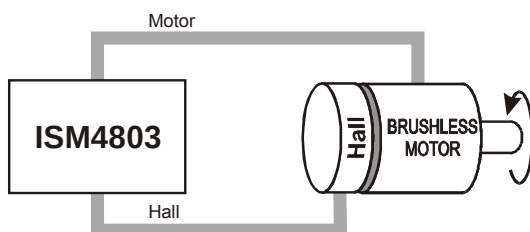
- **Brushless motor**



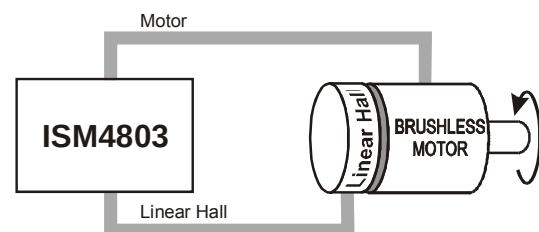
Brushless motor with encoder and Hall



Brushless motor with encoder

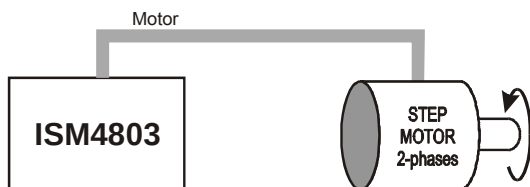


Brushless motor with Hall

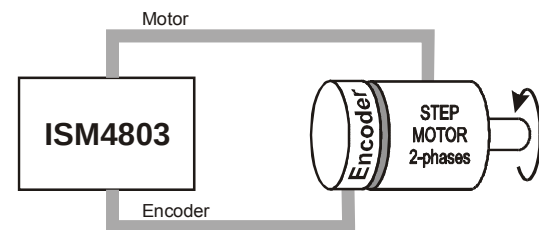


Brushless motor with Linear Hall sensor

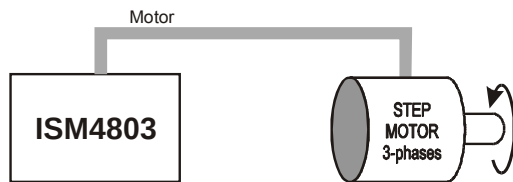
- **Step motor**



Step motor (2phases) – Open loop

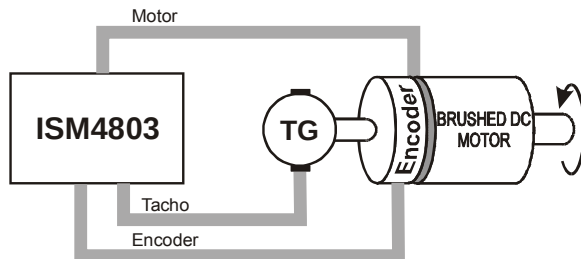


*Step motor (2phases) – Closed loop
(with encoder on motor, or on load)*

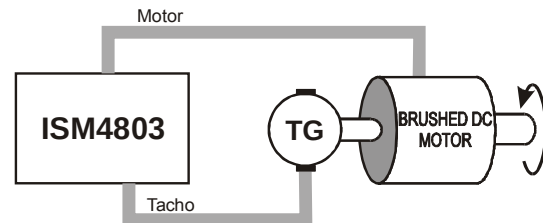


Step motor (3phases) – Open loop

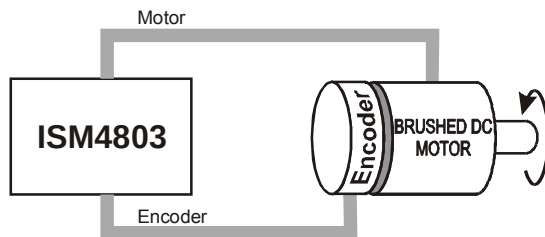
- **Brushed DC motor**



Brushed DC motor with tacho and encoder



Brushed DC motor with tacho



Brushed DC motor with encoder

3. Drive Drawings

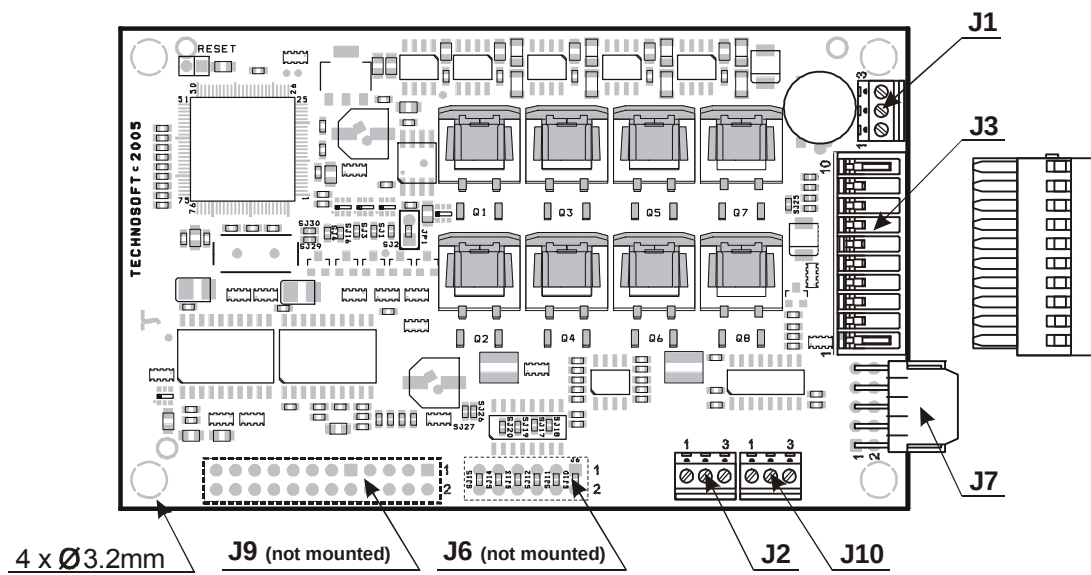


Figure 3.1. ISM4803 v1.2 layout

4. Connectors and Connection Diagrams



CAUTION! BEFORE THE CONNECTING / DISCONNECTING ANY OF THE SIGNALS PLEASE TURN OFF ALL POWER SUPPLIES. ELSE SEVER DAMAGE MAY OCCUR.

4.1. Connectors pinout

4.1.1. J1 Connector pinout

Pin	Pin name	Type	Function/Alternate function/ Comments
1	+V _{MOT}	I	Positive terminal of the 12–48V _{DC} external power supply for motor
2	GND	-	Ground
3	+5V _{DC}	I	Positive terminal of the +5V _{DC} external power supply for logic

4.1.2. J2 Connector pinout

Pin	Pin name	Type	Function/Alternate function/ Comments
1	TXD	O	RS232 Data Transmission
2	GND	-	Ground
3	RXD	I	RS232 Data Reception

4.1.3. J3 Connector pinout

Pin	Pin name	TML name	Type	Function/Alternate function/ Comments
1	B-	-	O	• Not used; Brushless motor • Phase B-; 2-phases Step motor • Not used; 3-phases Step motor • Not used; DC Brushed motor
2	A/A+	-	O	• Phase A; Brushless motor • Phase A+; 2-phases Step motor • Phase A; 3-phases Step motor • Motor +; DC Brushed motor
3	B/A-	-	O	• Phase B; Brushless motor • Phase A-; 2-phases Step motor • Phase B; 3-phases Step motor • Motor -; DC Brushed motor
4	C/B+	-	O	• Phase C; Brushless motor • Phase B+; 2-phases Step motor • Phase C; 3-phases Step motor • Not used; DC Brushed motor
5	+5V_{DC}	-	O	+5V _{DC} output voltage (from J1 connector)
6	H1	-	I	Hall 1 (digital)
7	H2	-	I	Hall 2 (digital)
8	H3	-	I	Hall 3 (digital)
9	GND	-	-	Ground
10	GND	-	-	Ground

4.1.4. J7 Connector pinout

Pin	Pin name	TML name	Type	Function/Alternate function/ Comments
1	GND	-	-	Ground
2	+5VDC	-	O	+5VDC output voltage (from J1 connector)
3	GND*	-	-	Ground (if SJ6 is strapped)
4	+5VDC	-	O	+5VDC output voltage (from J1 connector)
5	ENCA- / LH1	-	I	• Not used; Single-ended encoder • Encoder A-; Differential encoder • Linear Hall 1 (analog)
6	ENCA+	-	I	• Not used; Single-ended encoder • Encoder A+; Differential encoder
7	ENCB- / LH2	-	I	• Not used; Single-ended encoder • Encoder B-; Differential encoder • Linear Hall 2 (analog)
8	ENCB+	-	I	• Not used; Single-ended encoder • Encoder B+; Differential encoder
9	LH3	-	I	• Linear Hall 3 (analog)
10	ENCZ+	-	I	• Not used; Single-ended encoder • Encoder Z+; Differential encoder

4.1.5. J9 Connector pinout

Pin	Pin name	TML name	Type	Function/Alternate function/ Comments
1	OUT#12		O	General-purpose output; 3.3V compatible
2	IN#28		I	General-purpose input; 5V compatible
3	OUT#13		O	General-purpose output; 3.3V compatible
4	IN#29		I	General-purpose input; 5V compatible
5	OUT#14		O	General-purpose output; 3.3V compatible
6	IN#30		I	General-purpose input; 5V compatible
7	OUT#15		O	General-purpose output; 3.3V compatible
8	IN#31		I	General-purpose input; 5V compatible
9	LH3		I	Linear Hall 3 (analog)

10	+5VDC		O	+5VDC output voltage (from J1 connector)
11	REF	AD5	I	±10V analog input. May be used as analog position, speed or torque reference
12	FDBK	AD2	I	±10V analog input. May be used as tach feedback
13	GND		-	Ground
14	READY		O	Ready output; 3.3V compatible
15	GND		-	Ground
16	AUTORUN		I	Autorun input; The TML program is automatically executed at power-on; 3.3V compatible
17	IN#2/LSP		I	Limit Switch – Positive; 5V compatible
18	IN#24/LSN		I	Limit Switch – Negative; 5V compatible
19	ERROR		O	Error output; 3.3V compatible
20	Enable		I	Enable input; Connect to GND to disable PWM outputs; 5V compatible
21	PLS/A2-		I	- Pulse input in Pulse & Direction motion mode; Differential input – negative terminal 2nd encoder input; A channel; Differential input – negative terminal
22	DIR/B2-		I	- Direction input in Pulse & Direction motion mode; Differential input – negative terminal 2nd encoder input; B channel; Differential input – negative terminal
23	PLS/A2+		I	- Pulse input in Pulse & Direction motion mode; Differential input – positive terminal 2nd encoder input; A channel; Differential input – positive terminal
24	DIR/B2+		I	- Direction input in Pulse & Direction motion mode; Differential input – positive terminal 2nd encoder input; B channel; Differential input – positive terminal

4.1.6. J10 Connector pinout

Pin	Pin name	Type	Function/Alternate function/ Comments
1	CAN_H	I/O	Can-bus positive line (positive during dominant bit)
2	CAN_L	I/O	Can-bus negative line (negative during dominant bit)
3	GND	-	Ground

4.2. Digital I/O connection

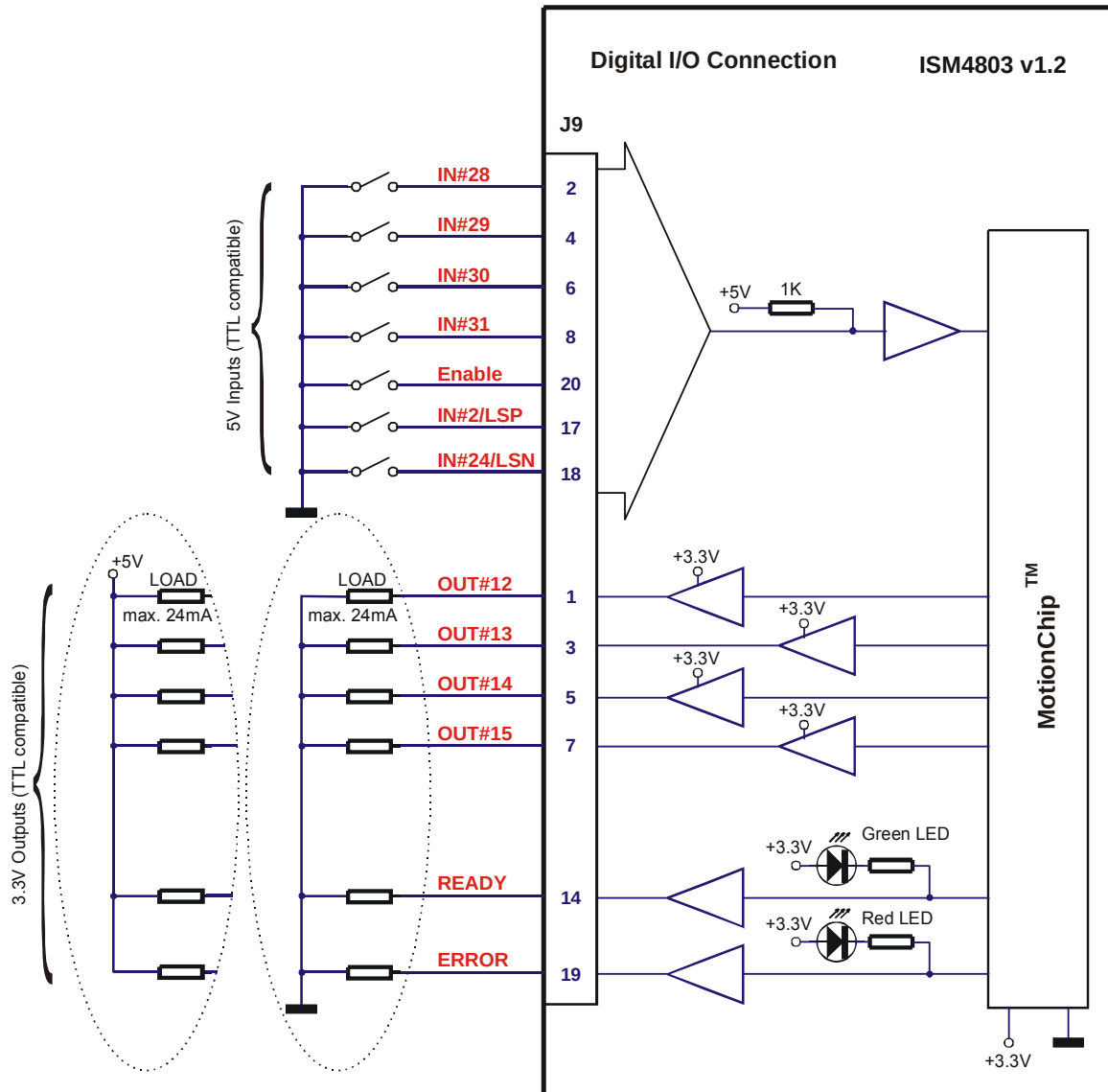


Figure 4.1. Digital I/O connection

Note1: The maximum current output is 24mA each.

Note2: All outputs are 3.3V compatible. These are compatible with TTL inputs.

4.3. Pulse & Direction inputs connections

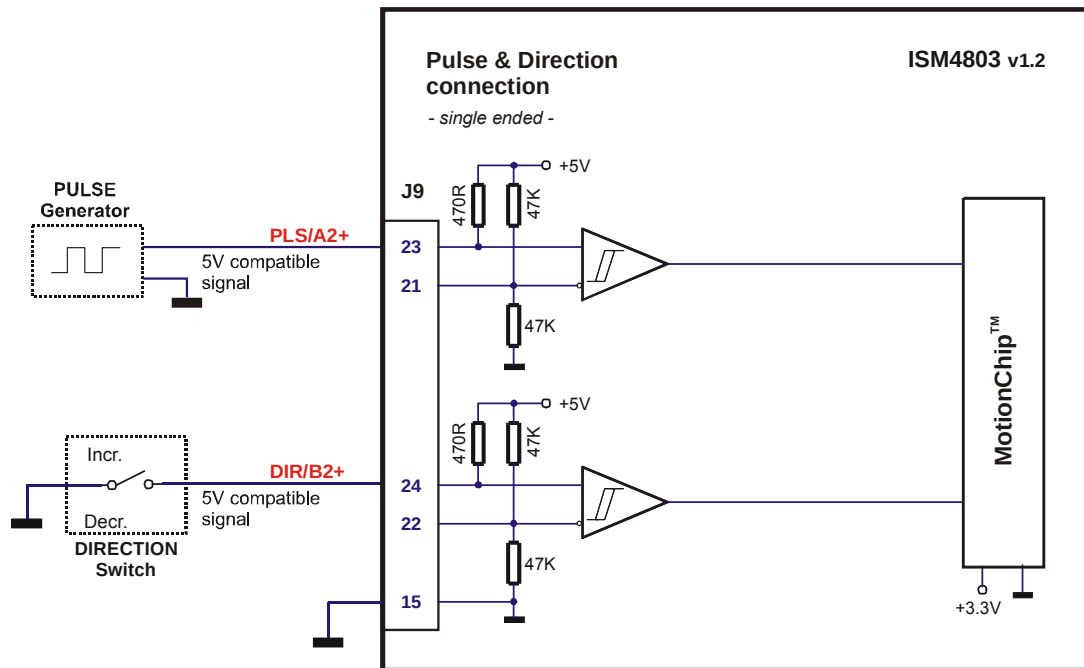


Figure 4.2. Pulse & Direction inputs connection – single-ended

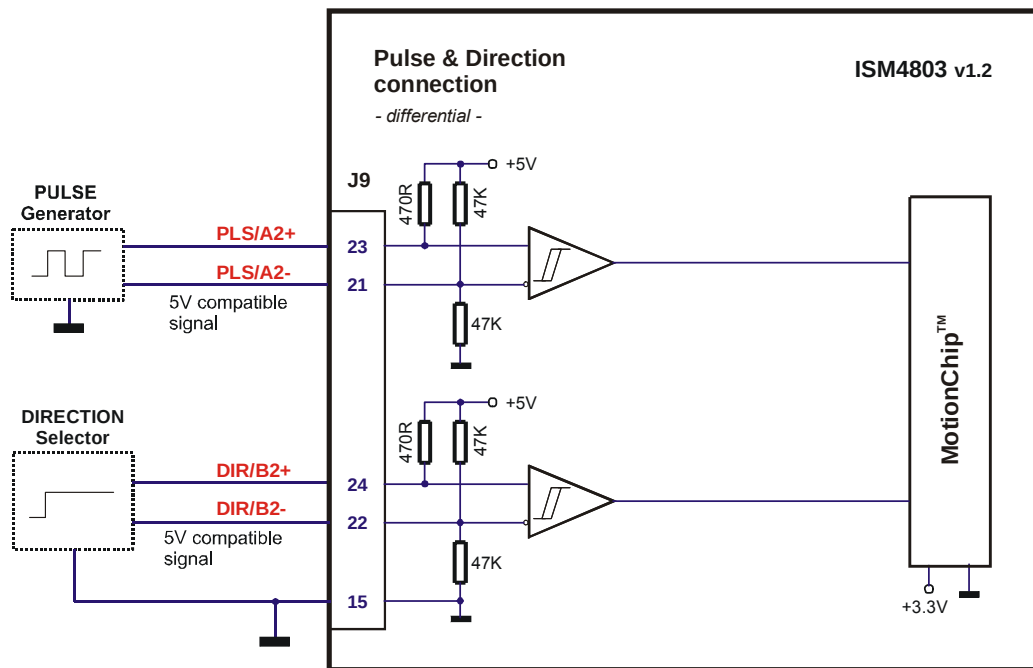


Figure 4.3. Pulse & Direction inputs connection – differential

4.4. Analog inputs connection

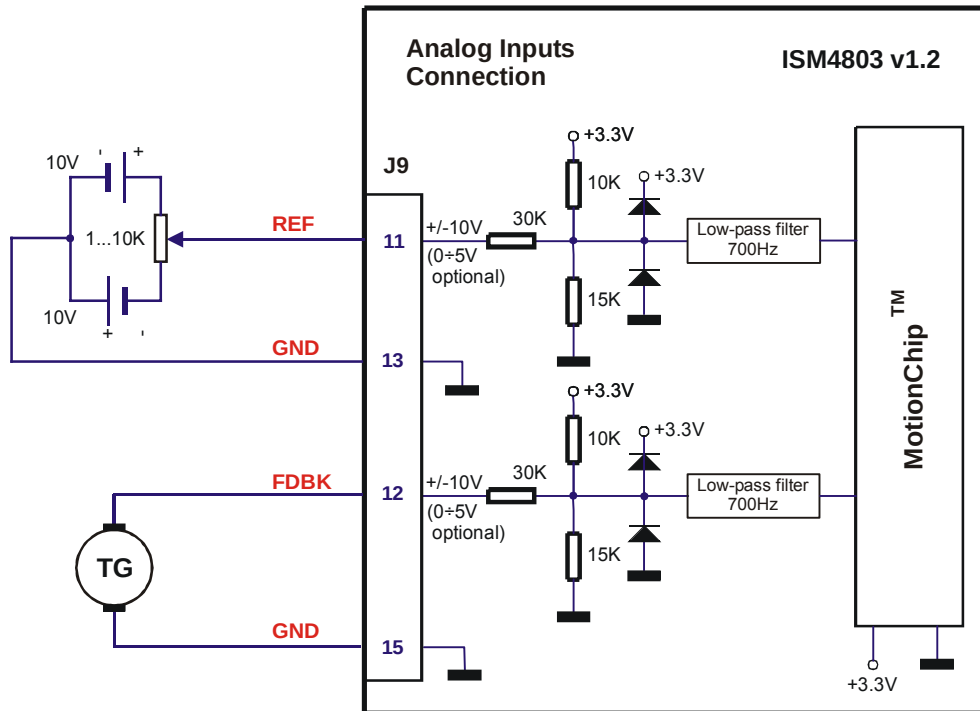


Figure 4.4. Analog inputs connection

Note 1: Default input range for analog inputs is +/-10 V. For a 0÷5 V range, please contact Technosoft.

4.5. Brushless Motor connection

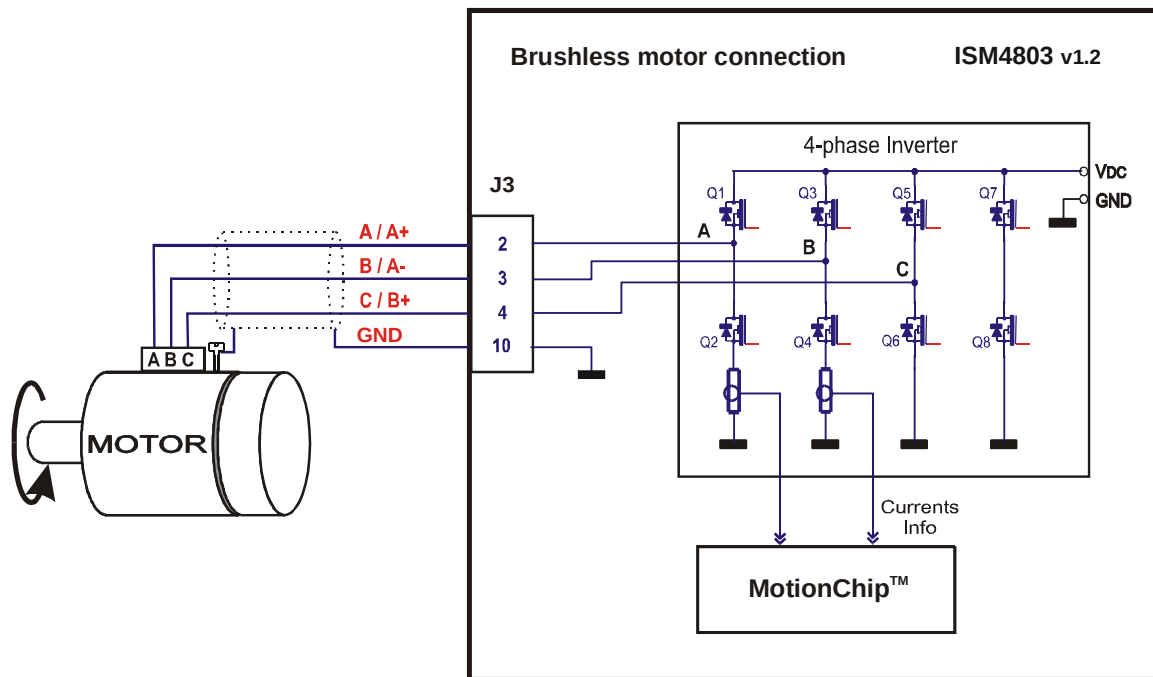


Figure 4.5. Brushless Motor connection



CAUTION!

BEFORE CONNECTING THE MOTOR, BE SURE YOU HAVE THE RIGHT APPLICATION PROGRAMMED TO E2ROM, ELSE YOU CAN DAMAGE THE MOTOR AND DRIVE. AT POWER-ON, THE TML APPLICATION IS AUTOMATICALLY EXECUTED. SEE SECTION 4.16. SPECIAL CONNECTION ON HOW TO DISABLE THIS FEATURE.

4.6. 2-phases Step Motor connection

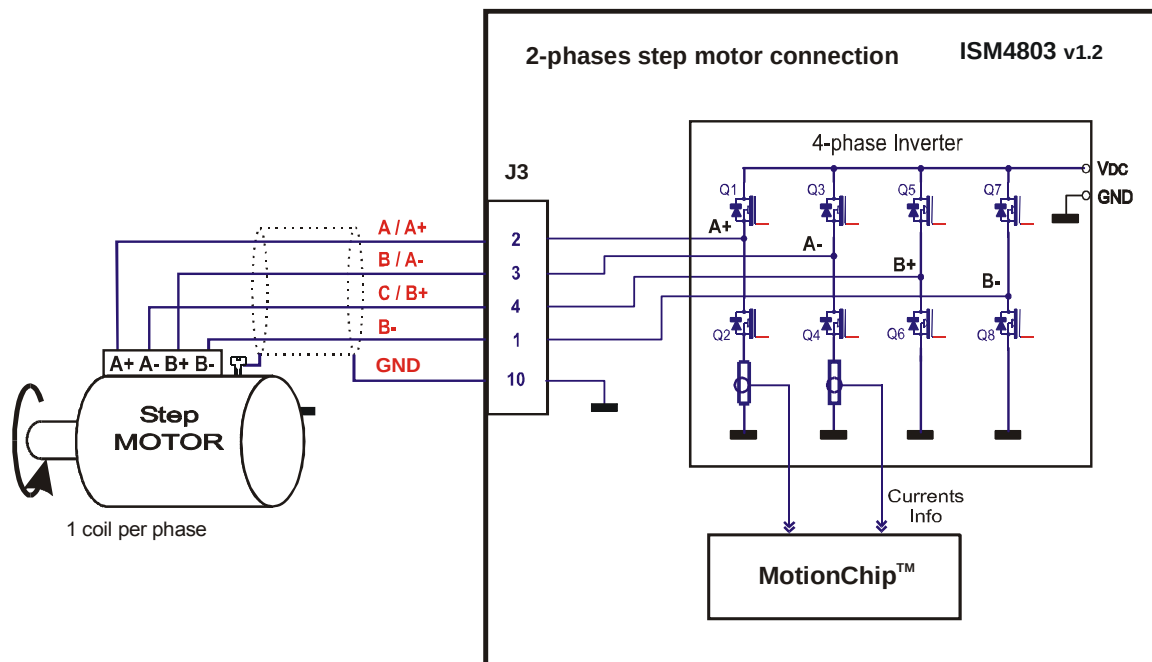


Figure 4.6. Step Motor connection



CAUTION!

BEFORE CONNECTING THE MOTOR, BE SURE YOU HAVE THE RIGHT APPLICATION PROGRAMMED TO E2ROM, ELSE YOU CAN DAMAGE THE MOTOR AND DRIVE. AT POWER-ON, THE TML APPLICATION IS AUTOMATICALLY EXECUTED. SEE SECTION 4.16. SPECIAL CONNECTION ON HOW TO DISABLE THIS FEATURE.

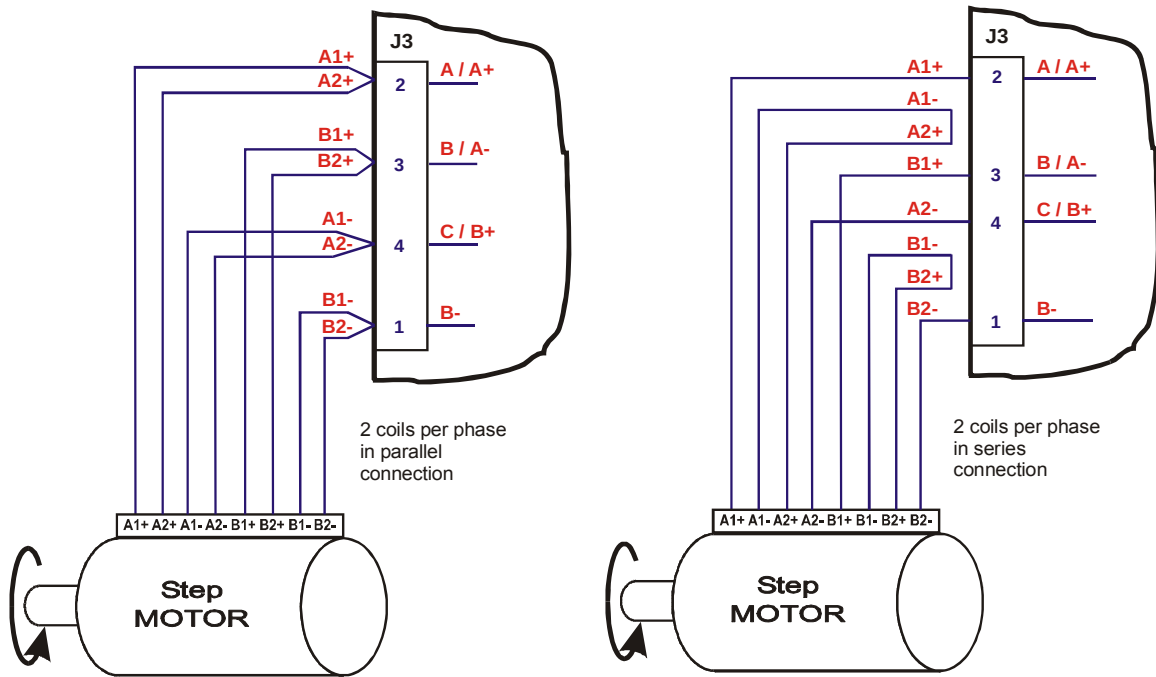


Figure 4.7. Step Motor connection



CAUTION!

BEFORE CONNECTING THE MOTOR, BE SURE YOU HAVE THE RIGHT APPLICATION PROGRAMMED TO E2ROM, ELSE YOU CAN DAMAGE THE MOTOR AND DRIVE. AT POWER-ON, THE TML APPLICATION IS AUTOMATICALLY EXECUTED. SEE SECTION 4.16. SPECIAL CONNECTION ON HOW TO DISABLE THIS FEATURE.

4.7. 3-phases Step Motor connection

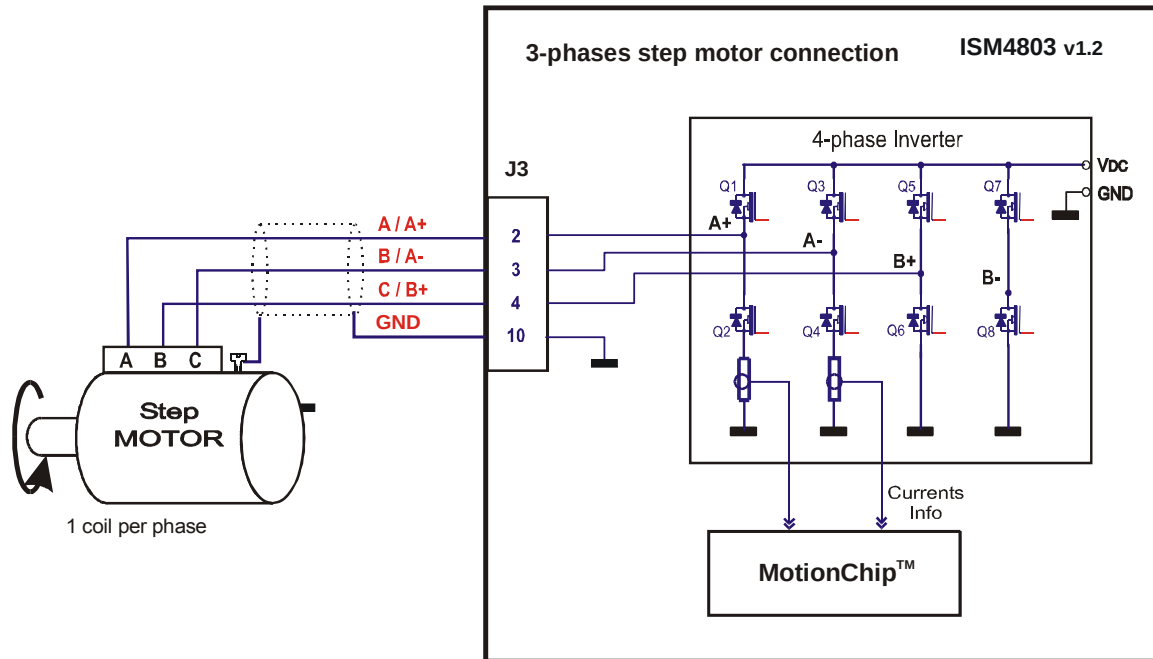


Figure 4.8. Step Motor connection



CAUTION!

BEFORE CONNECTING THE MOTOR, BE SURE YOU HAVE THE RIGHT APPLICATION PROGRAMMED TO E2ROM, ELSE YOU CAN DAMAGE THE MOTOR AND DRIVE. AT POWER-ON, THE TML APPLICATION IS AUTOMATICALLY EXECUTED. SEE SECTION 4.16. SPECIAL CONNECTION ON HOW TO DISABLE THIS FEATURE.

4.8. DC Motor connection

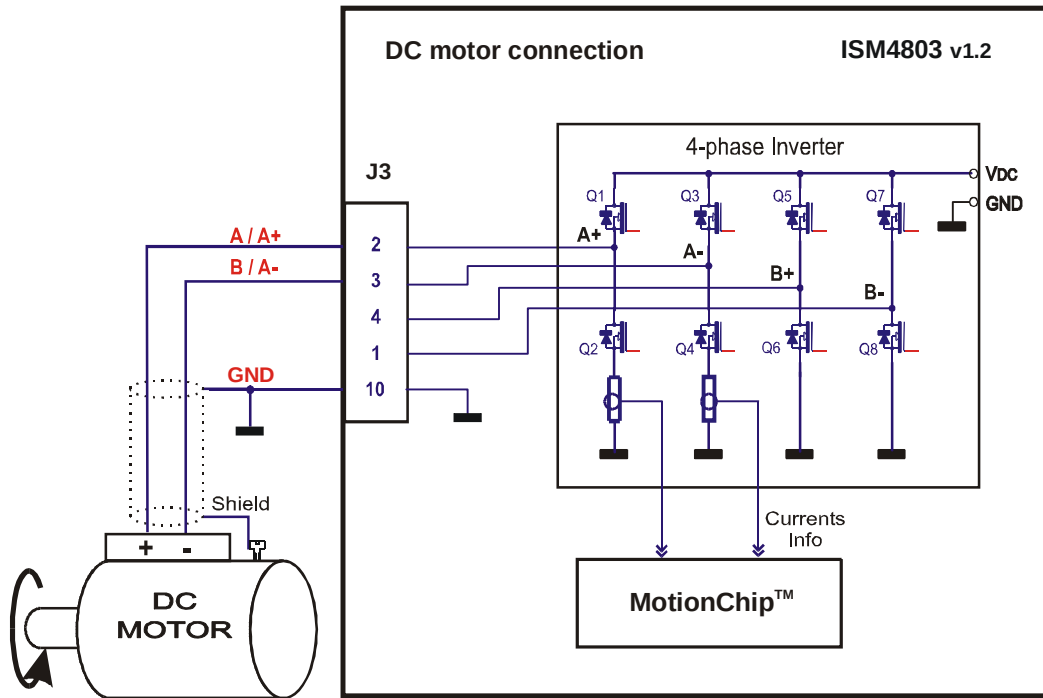


Figure 4.9. DC Motor connection



CAUTION!

BEFORE CONNECTING THE MOTOR, BE SURE YOU HAVE THE RIGHT APPLICATION PROGRAMMED TO E2ROM, ELSE YOU CAN DAMAGE THE MOTOR AND DRIVE. AT POWER-ON, THE TML APPLICATION IS AUTOMATICALLY EXECUTED. SEE SECTION 4.16. SPECIAL CONNECTION ON HOW TO DISABLE THIS FEATURE.

4.9. Single-ended encoder connection

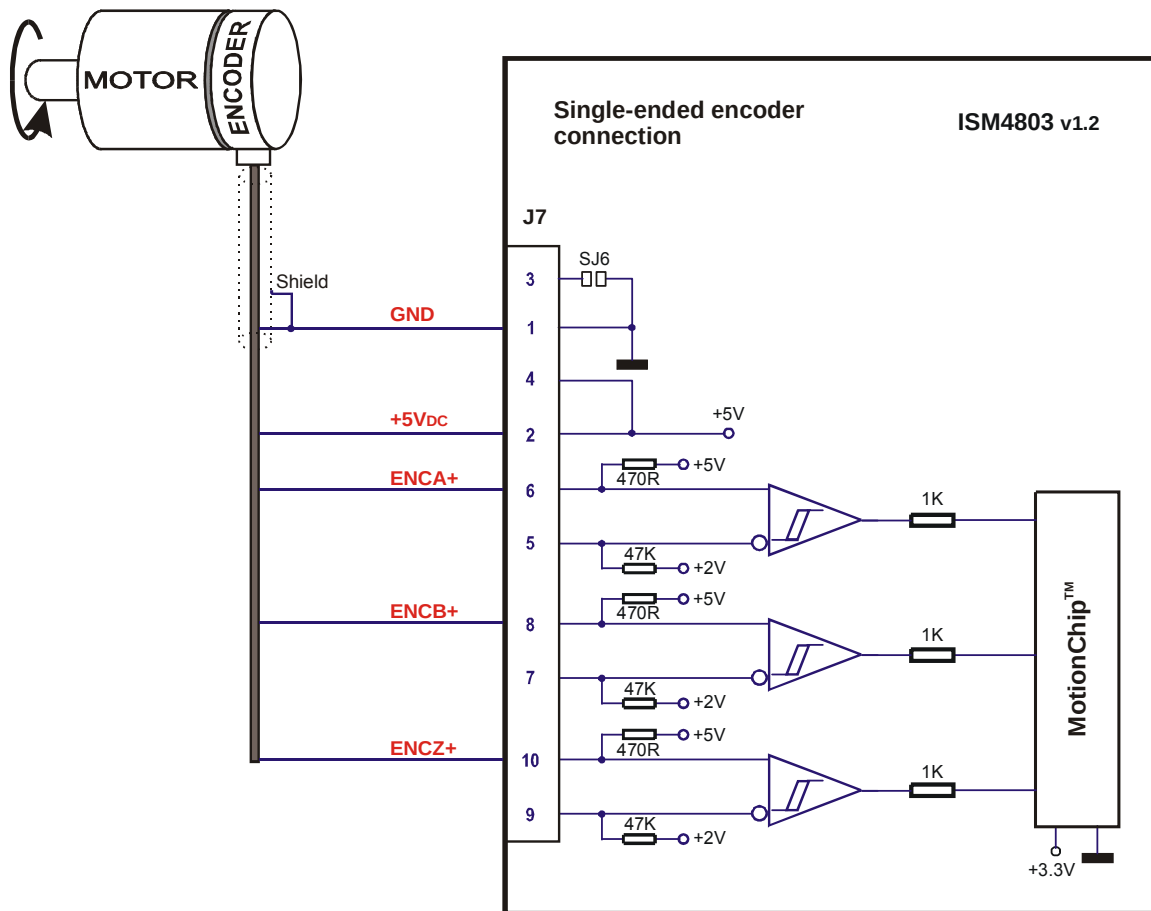


Figure 4.10. Single-ended encoder connection

4.10. Differential encoder connection

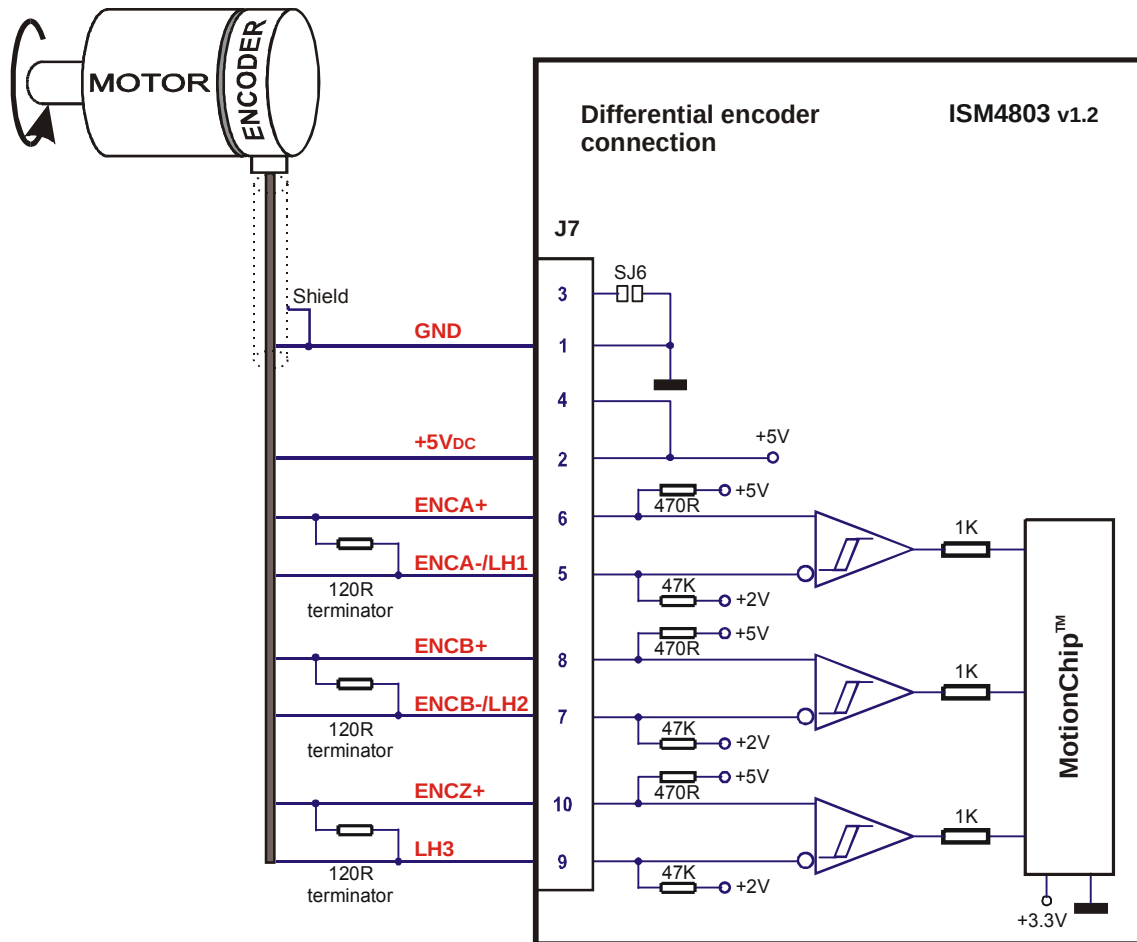
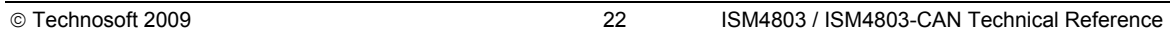


Figure 4.11. Differential encoder connection

Note 1: 120- Ω (0.25-W) terminators are required for long encoder cables, or noisy environments.



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4.12. Linear Hall connection

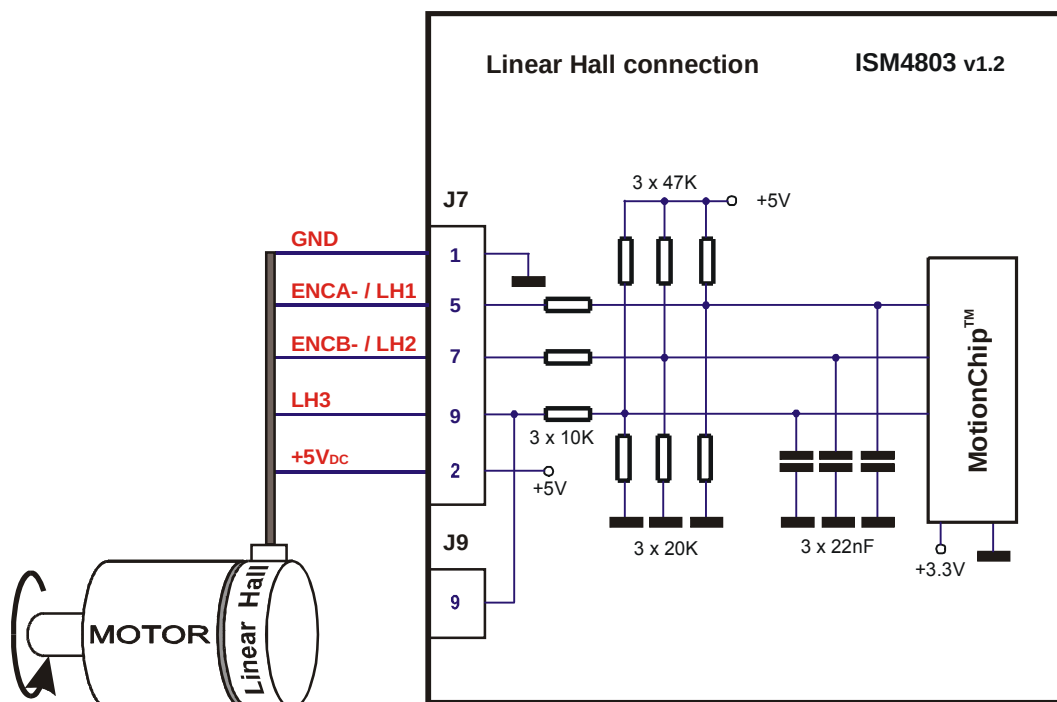


Figure 4.13. Linear Hall connection

4.13. Linear Hall Auto-Setup connection

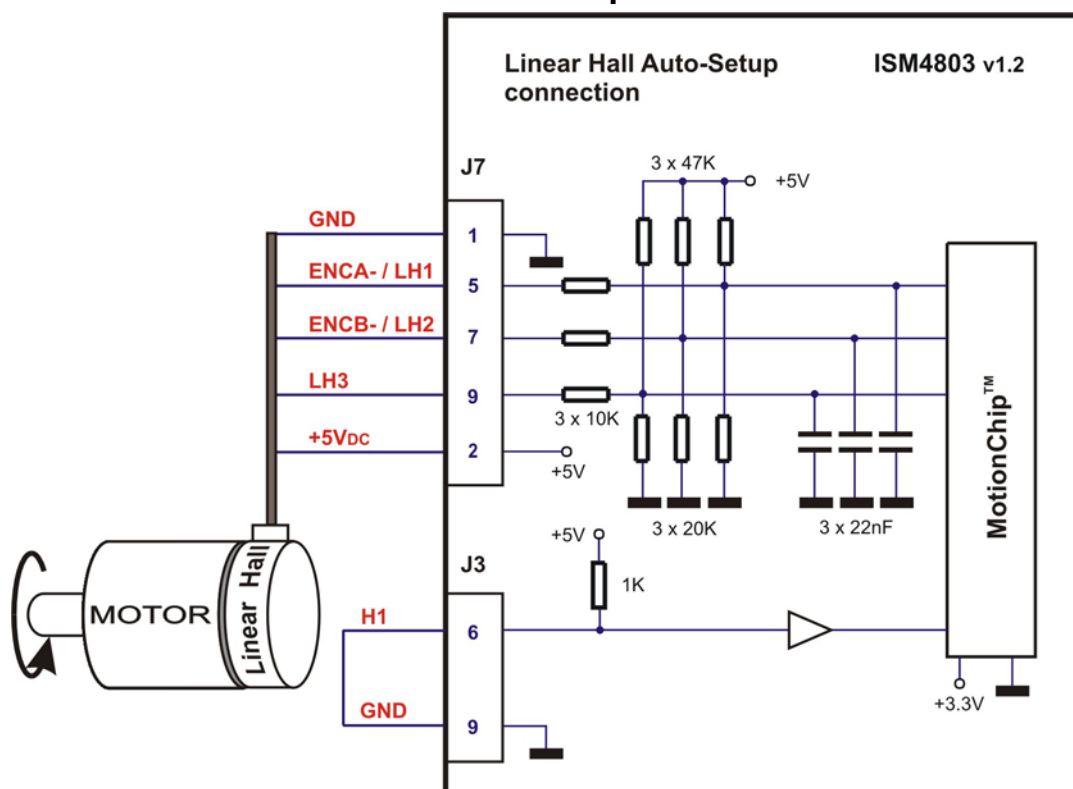


Figure 4.14. Linear Hall Auto-Setup connection

Note 1: Linear Hall auto-setup connection requires a valid TML application (configured for linear Hall sensors) to be previously downloaded

4.14. Recommendations for feedback wiring

- Always connect both positive and negative signals when the encoder or the Hall sensors are differential and provides them. Use one twisted pair for each differential group of signals as follows: Enc A+ with A-/LH1, Enc B+ with B-/LH2. Use another twisted pair for the 5V supply and GND.
- Always use shielded cables to avoid capacitive-coupled noise when using single-ended encoders or Hall sensors with cable lengths over 1 meter. Connect the cable shield to the GND, at only one end. This point could be either the ISM4803 (using the GND pin) or the encoder / motor. Do not connect the shield at both ends.
- If the ISM4803 5V supply output is used by another device (like for example an encoder) and the connection cable is longer than 5 meters, add a decoupling capacitor near the supplied device, between the +5V and GND lines. The capacitor value can be 1...10 μF , rated at 6.3V.

4.15. Supply connection

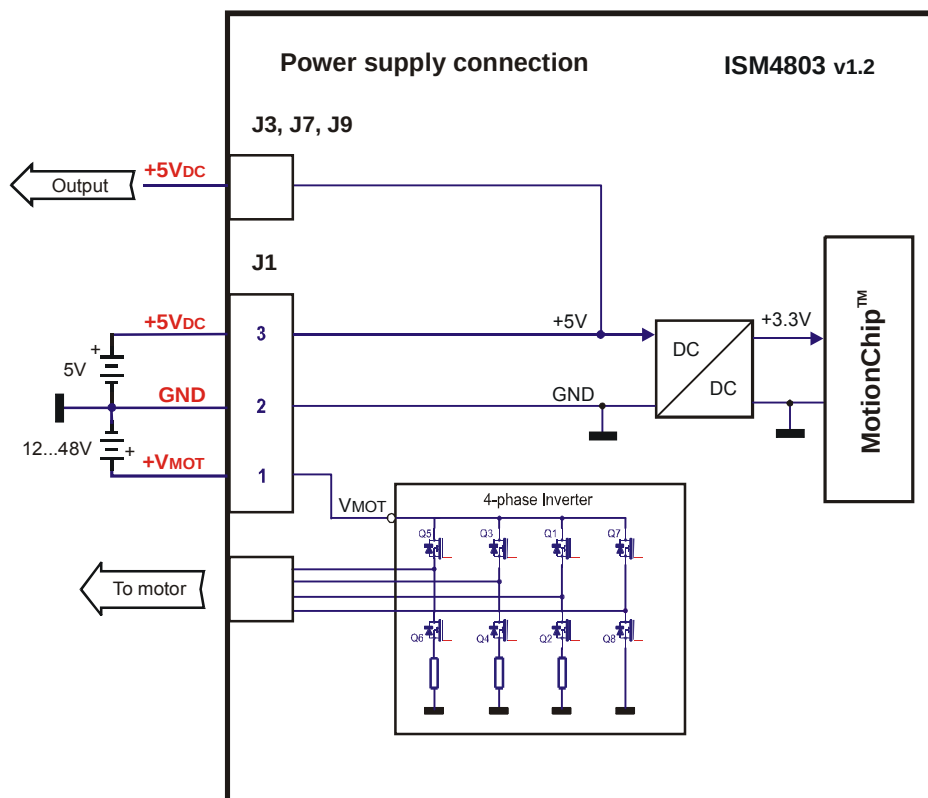


Figure 4.15. Supply connection

4.16. Serial RS-232 connection

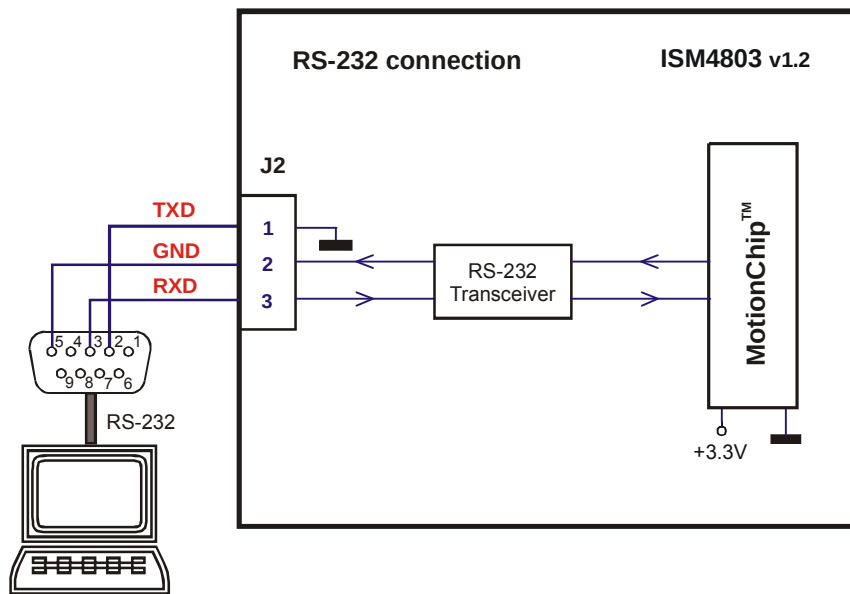


Figure 4.16 Serial RS-232 connection

4.17. CAN connection (only for ISM4803-CAN drive)

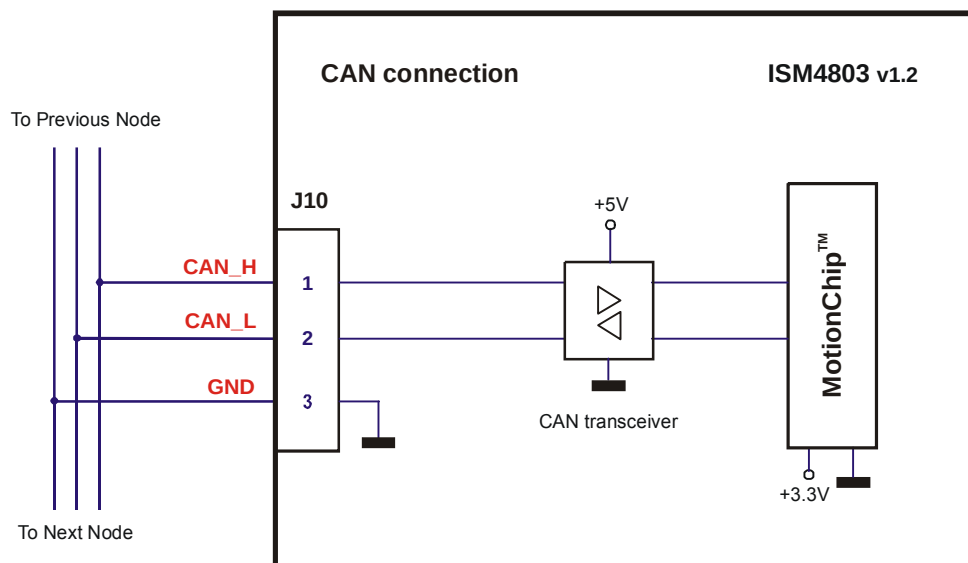


Figure 4.17. CAN connection

Note1: The CAN network requires a 120-Ohm terminator. This is not included on the board. See Figure 4.18.

Note2: CAN signals are not insulated from other ISM4803 circuits.

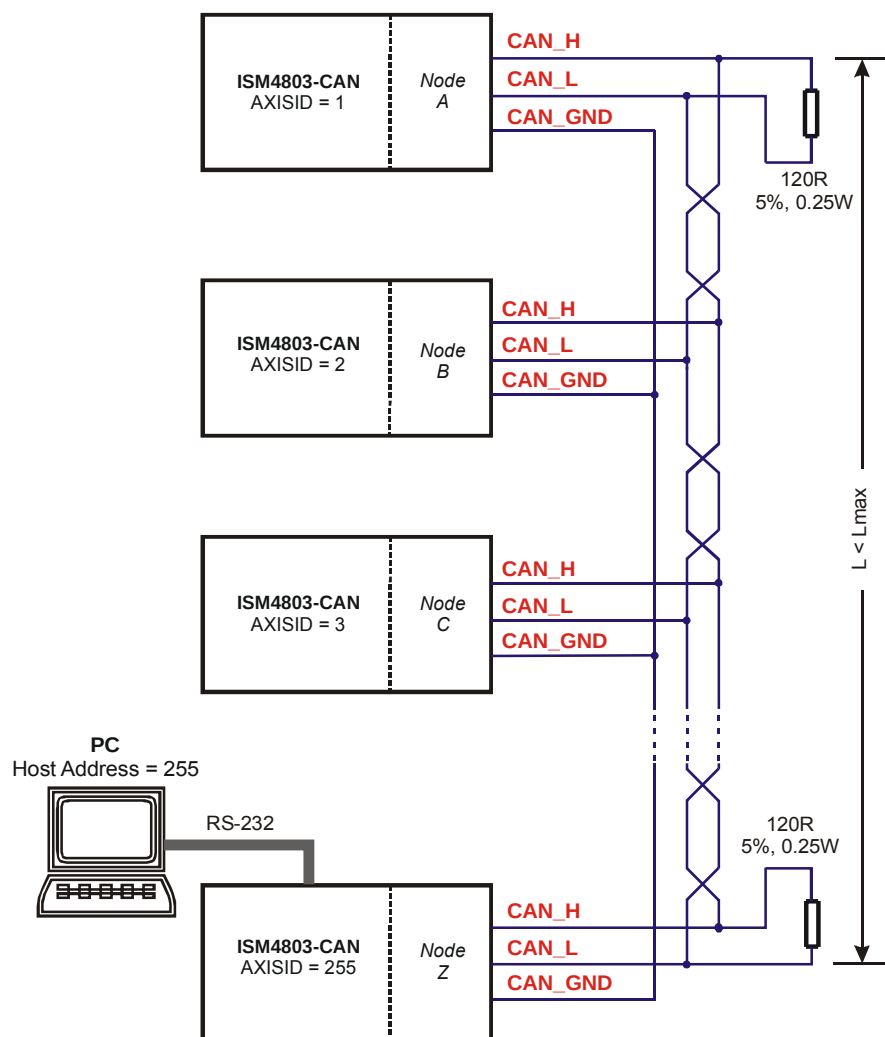


Figure 4.18. Multiple-Axis CAN network (only for ISM4803-CAN)

Note1: The AxisID must be set by software or by hardware from J6/solder-joints.

4.18. Master - Slave encoder connection

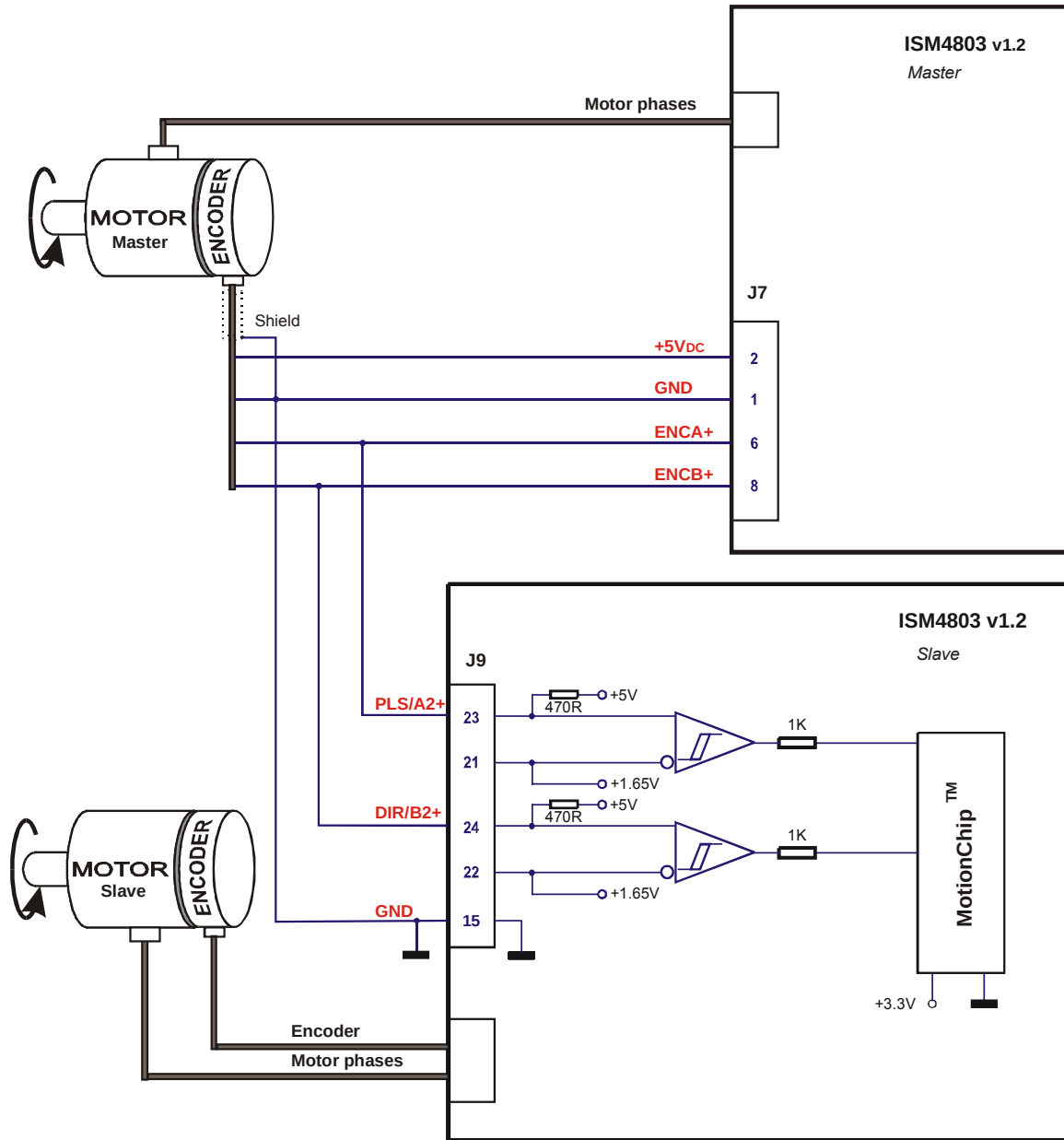


Figure 4.19. Master – Slave encoder connection using second encoder input

4.19. Jumpers and solder-joints

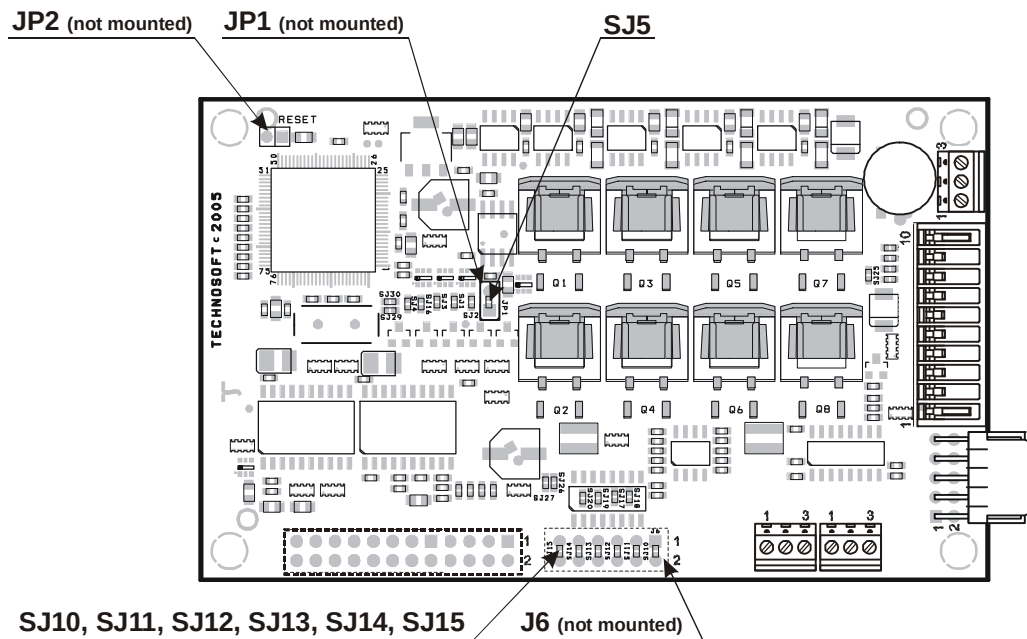


Figure 4.20. Jumpers and solder-joints

- o **JP1 jumper or SJ5 solder-joint:** Auto / Ext
 - **SHORT:** ISM4803 in Autorun (stand-alone) mode. After reset, automatically executes a program from the internal E2ROM.
 - **OPEN:** ISM4803 in External (slave) mode. After reset, waits for commands from an external device.
- o **JP2 jumper:** Reset
 - **SHORT:** Keep the drive in Reset state
 - **OPEN:** Leave the drive to run the firmware
- o **SJ1 solder-joint:** FU / Norm
 - **SHORT:** Enable firmware update
 - **OPEN:** Normal operation

- o **J6 jumpers connector / SJ10, SJ11, SJ12, SJ13, SJ14, SJ15 solder-joints**

These jumpers are sampled during power-up, and the Axis ID is configured accordingly. See *Table 5.2*.

When the software development and tests are finished, solder joints can be used instead of jumpers. See the following table.

Table 5.1 Correspondence between jumpers and solder joints

Jumper	Equivalent solder-joint	Function
J6 position 1-2	SJ10	ID-Bit0
J6 position 3-4	SJ11	ID-Bit1
J6 position 5-6	SJ12	ID-Bit2
J6 position 7-8	SJ13	ID-Bit3
J6 position 9-10	SJ14	ID-Bit4
J6 position 11-12	SJ15	reserved

Table 5.2. Axis ID configuration

JP6 position					Axis ID
9-10	7-8	5-6	3-4	1-2	
ID – Bit4	ID – Bit3	ID – Bit2	ID – Bit1	ID – Bit0	
OPEN	OPEN	OPEN	OPEN	OPEN	255
OPEN	OPEN	OPEN	OPEN	SHORT	1
OPEN	OPEN	OPEN	SHORT	OPEN	2
OPEN	OPEN	OPEN	SHORT	SHORT	3
OPEN	OPEN	SHORT	OPEN	OPEN	4
OPEN	OPEN	SHORT	OPEN	SHORT	5
OPEN	OPEN	SHORT	SHORT	OPEN	6
OPEN	OPEN	SHORT	SHORT	SHORT	7
OPEN	SHORT	OPEN	OPEN	OPEN	8
OPEN	SHORT	OPEN	OPEN	SHORT	9
OPEN	SHORT	OPEN	SHORT	OPEN	10
OPEN	SHORT	OPEN	SHORT	SHORT	11
OPEN	SHORT	SHORT	OPEN	OPEN	12
OPEN	SHORT	SHORT	OPEN	SHORT	13
OPEN	SHORT	SHORT	SHORT	OPEN	14
OPEN	SHORT	SHORT	SHORT	SHORT	15
SHORT	OPEN	OPEN	OPEN	OPEN	16
SHORT	OPEN	OPEN	OPEN	SHORT	17
SHORT	OPEN	OPEN	SHORT	OPEN	18
SHORT	OPEN	OPEN	SHORT	SHORT	19
SHORT	OPEN	SHORT	OPEN	OPEN	20
SHORT	OPEN	SHORT	OPEN	SHORT	21
SHORT	OPEN	SHORT	SHORT	OPEN	22
SHORT	OPEN	SHORT	SHORT	SHORT	23
SHORT	SHORT	OPEN	OPEN	OPEN	24
SHORT	SHORT	OPEN	OPEN	SHORT	25
SHORT	SHORT	OPEN	SHORT	OPEN	26
SHORT	SHORT	OPEN	SHORT	SHORT	27
SHORT	SHORT	SHORT	OPEN	OPEN	28
SHORT	SHORT	SHORT	OPEN	SHORT	29
SHORT	SHORT	SHORT	SHORT	OPEN	30
SHORT	SHORT	SHORT	SHORT	SHORT	31

Note1: Other Axis ID values (32 - 255) can be set by software.

5. Electrical Specifications

Electrical characteristics:

All parameters are measured under the following conditions (unless otherwise noted):

- $T_{amb} = 25^{\circ}\text{C}$, logic supply (V_{LOG}) = 5 V_{DC} , motor supply (V_{MOT}) = 48 V_{DC} ;
- Supplies start-up / shutdown sequence: -any- ;
- Load current 4 A_{RMS} .

Logic Supply Input

Measured between +5 V_{DC} terminal and GND.		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	4.75	5	5.25	V_{DC}
	Absolute maximum values, continuous	0		5.5	V_{DC}
	Absolute maximum values, surge (duration $\leq 10\text{ms}$) [†]	-0.5		6.8	V_{DC}
Supply current	Normal operation		400	600	mA

Motor Supply Input

Measured between + V_{MOT} and GND.		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	12		48	V_{DC}
	Absolute maximum values, continuous	0		50	V_{DC}
	Absolute maximum values, surge (duration $\leq 10\text{ms}$) [†]	-0.5		52	V
Supply current	Idle		3	5	mA
	Operating	-6.1	± 4	+6.1	A

Motor Outputs

All voltages referenced to GND.		Min.	Typ.	Max.	Units
Motor output current	Continuous operation, BLDC	-3		+3	A_{RMS}
Motor output current, peak		-6.1		+6.1	A
Short-circuit protection threshold	Short-circuit protection is effective for all short-circuits except Phase2 ("B" or "A-") to + V_{MOT} , and Phase4 ("BR" or "B-") to + V_{MOT}	± 8.5	± 12	± 21	A_{PEAK}
Short-circuit protection delay		3	7	10	μS
Motor output current accuracy	$T_{amb} = 0$ to $+40^{\circ}\text{C}$	-15	± 4	+5	%FS ¹
Motor inductance	$F_{PWM} = 20\text{kHz}$, + $V_{MOT} = 12\text{V}$	50	100		μH
	$F_{PWM} = 20\text{kHz}$, + $V_{MOT} = 48\text{V}$	200	400		

5 V Digital Inputs (except Encoder, Pulse, Dir inputs)

All voltages referenced to GND.		Min.	Typ.	Max.	Units
Input voltage	Logic "LOW"	-0.5	0	0.8	V
	Logic "HIGH"	2.0	5	5.5	
	Absolute maximum values, surge † (duration ≤ 10mS)	-1		+7	
Input current	Logic "HIGH"; Internal pull-up to +5V	0	0	0	mA
	Logic "LOW"	4	5	6	
Input frequency		0		200	KHz
Pulse width	"0" → "1" → "0", "1" → "0" → "1"	2			μS
ESD protection	Human body model (100pF, 1.5KΩ)	±2			KV

3.3V Digital Outputs

All voltages referenced to GND.		Min.	Typ.	Max.	Units
Output voltage, logic "LOW"	Output current 12mA	0	0.2	0.4	V
	Output current 24mA			0.55	
Output voltage, logic "HIGH"	Output current 12mA	2.4	3.0	3.3	V
	Output current 24mA	2.2			
Output voltage	Absolute maximum, surge † (duration ≤ 10mS)	-1		+7	V
Output current	Normal operation			±24	mA
	Absolute maximum, continuous †			±50	
ESD protection	Human body model (100pF, 1.5KΩ)	±4			KV

Encoder, PLS, DIR Inputs

		Min.	Typ.	Max.	Units
Single-ended operation (ENCA-, ENCB-, PLS-, DIR- not connected)	Input voltage, logic "LOW" threshold	1.2	1.4	1.6	V
	Input voltage, logic "HIGH" threshold	1.7	1.9	2.1	
	Input current, logic "LOW"	9	11	13	mA
	Input current, logic "HIGH"; Internal pull-up to +5V	0	0	0	
	Input frequency			250	KHz
Differential operation (RS-422)	Input voltage hysteresis	0.1	0.2	0.5	V
	Input impedance, differential	6	8	10	KΩ
	Fail-safe state	Logic "HIGH"			
	Input frequency			8	MHz
Input voltage	Normal operation	-0.5	0...5	+7	V
	Absolute maximum, continuous †	-25		+25	
Pulse width	"0" → "1" → "0", "1" → "0" → "1"	0.3			μS
ESD protection	Human body model (100pF, 1.5KΩ)	±2			KV

Analogue Inputs (REF, FDBK)

Referenced to GND.		Min.	Typ.	Max.	Units
Voltage range			±10		V
Input impedance		15			KΩ
Resolution			10		bits
Differential linearity	Guaranteed 10-bits no-missing-codes			0.09	% FS ¹
Offset error			±0.5	±3	% FS ¹
Gain error			±1	±4	% FS ¹
Bandwidth (-3dB)			700		Hz
ESD protection	Human body model (100pF, 1.5KΩ)	±4			KV

Linear Hall Inputs (LH1, LH2, LH3)

Referenced to GND.		Min.	Typ.	Max.	Units
Voltage range	Maximum range	0		5	V
	Operating range	Programmable			
Input current		-0.5		+0.5	mA
Bandwidth (-3dB)			1		KHz
ESD protection	Human body model (100pF, 1.5KΩ)	±1			KV

RS-232

		Min.	Typ.	Max.	Units
Standards compliance		TIA/EIA-232-C			
Bit rate	Depending on software settings	9600		115200	Baud
ESD Protection	Human Body Model (100pF, 1.5 KΩ)			±15	KV
Input voltage	RX232 input	-25	-	+25	V
Output short-circuit withstand	TX232 output to GND	Guaranteed			

CAN (only for ISM4803-CAN)

		Min.	Typ.	Max.	Units
Standards compliance		CAN-Bus 2.0B error active; ISO 11898-2			
Transmission line impedance	Recommended; Measured at 1MHz	90	120	150	Ω
Bit rate	Depending on software settings	125		1000	Kbps
Number of network nodes	Depending on SW settings			64	-
ESD Protection	Human Body Model			±15	KV

Others

		Min.	Typ.	Max.	Units
Operating temperature		0		+40	°C
Weight			50		g
Storage temperature	Not powered	-40	85	°C	
Humidity	Non-condensing	0	90	%RH	

¹ "FS" stands for "Full Scale"

[†] Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device.
Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

T.B.D. = To be determined

6. ISM4803 LEDs

LED	Function
LED1 - Green	Turned on when OUT#25 output is set low. Default state: turned on
LED2 - Red	Turned on when the power stage error signal is generated or when OUT#39 is set low Default state: turned off

7. ISM4803 Dimensions

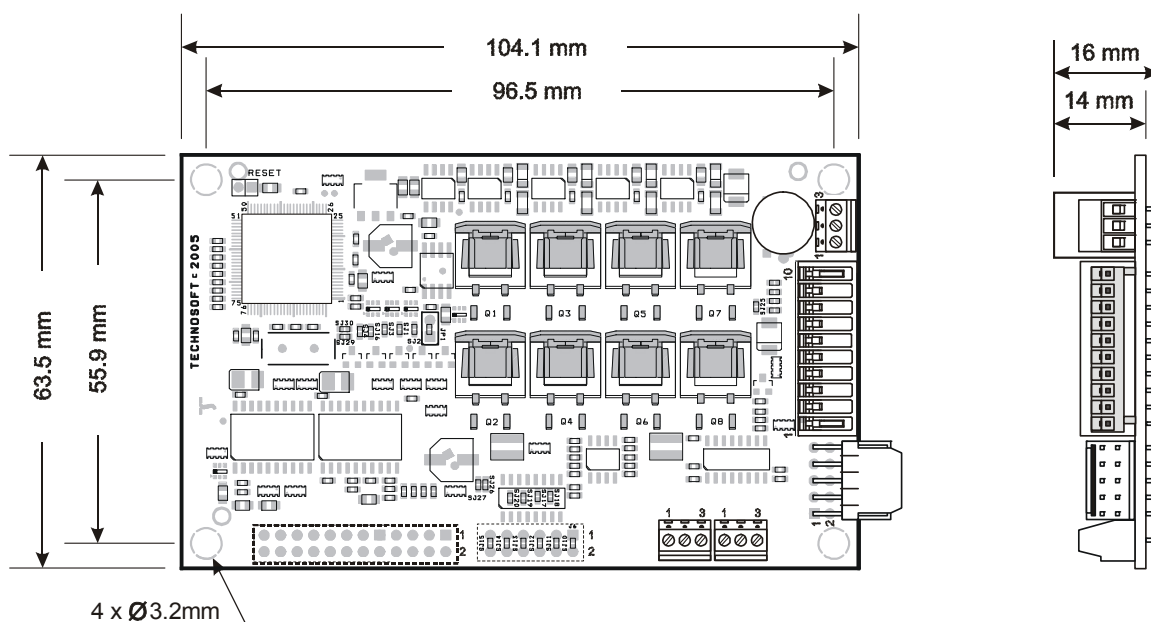


Figure 7.1. ISM4803 dimensions

8. Connector Type and Mating Connectors

Reference	Producer	Board connector	Mating Connector
J1	Phoenix Contact	MPT 0,5/3-2,54	-
J2	Phoenix Contact	MPT 0,5/3-2,54	-
J3	Wago	733-370	733-110
J7	FCI	76383-305	65239-005 ^{1, 2}
J10	Phoenix Contact	MPT 0,5/3-2,54	-

¹ Mating connectors not included

² The J7 mating connector requires crimp terminals: FCI 76357-303, for wire AWG22...AWG30

9. Scaling factors

9.1. Supply / DC-bus Voltage Measurement Scaling

ISM4803 include a supply / DC-bus voltage feedback. In the TML environment, the A/D converted value of the supply / DC-bus voltage feedback can be read as TML variable *AD4*.

The scaling factor for the DC-bus voltage measurement is:

$$\text{DC-bus [V]} = \frac{V_{mm} [\text{V}]}{65472 [\text{bits}]} \times \text{AD4} [\text{bits}]$$

where:

V_{mm} is the maximum measurable DC-bus voltage; this value is 52.8V
65472 is the AD4 value for DC-bus voltage = V_{mm}

Remark: The *AD4* value is the result of a 10-bit A/D conversion, left-shifted by 6. The 6 LSB of *AD6* are always 0. If the A/D conversion result varies by 1 LSB, this translates into a variation of the *AD4* value by $2^6 = 64$.

9.2. Motor Currents Scaling

ISM4803 measure motor currents through shunts placed in the lower legs of the inverter. Only currents measured on phases A and B are connected to 2 A/D inputs with a current gain factor of 0.1V/A. The shunt on phase C is only used to sense a short-circuit. In applications with 3-phase AC motors, TML variables *IA* and *IB* provide the motor currents in phases A and B. In applications with DC or brushless DC motors, the TML variable *IQ* gives the motor current. The scaling factor for the motor currents is:

$$\text{Motor current [A]} = \frac{1.65 [\text{V}]}{32704 [\text{bits}] \times 0.27 [\text{V} / \text{A}]} \times \text{TML current} [\text{bits}], \text{ or}$$

$$\text{Motor current [A]} = \frac{6.11 [\text{A}]}{32704 [\text{bits}]} \times \text{TML current} [\text{bits}]$$

Remark: The A/D conversion result has a 10-bit resolution and is used left-shifted by 6. The 6 LSB of TML currents are always 0. If the A/D conversion result varies by 1 LSB, this translates into a variation of the TML current value by $2^6 = 64$.

9.3. Motor Speed Scaling

The TML variable ASPD gives the motor speed. The scaling factor depends on the speed sensor.

When the motor has a position sensor like an encoder, the speed can be estimated as position increment per speed-loop sampling period (set by default to 1 ms). In this case, the scaling factor is

$$\text{Motor speed [rpm]} = \frac{60}{4 \times N \text{ [lines]} \times T[\text{s}]} \times \text{ASPD [bits]}$$

where N is the number of encoder lines

T is the speed-loop sampling period [in seconds]

4 is the multiplication ratio of the position resolution done in the encoder interface

Example: If T = 1ms, and N = 500 lines, motor speed [rpm] = 30 × ASPD [bits]

If the speed feedback is provided by a tachometer connected to the ISM4803 analog input **FDBK**, the scaling factor is (for unipolar operation, i.e. 0...+ max.speed):

$$\text{Motor speed [rpm]} = \frac{3.3[\text{V}]}{1024[\text{bits}] \times 0.66[\text{V} / \text{V}] \times K_T[\text{V} / \text{rpm}]} \times \text{ASPD [bits]}$$

where K_T is the tachometer constant

0.66 [V/V] is the ISM4803 feedback gain factor

Remark: In speed control motion modes, the speed reference should be provided in the same units as ASPD, i.e. based on the same scaling as for the speed measurement.

9.4. Motor Position Scaling

The TML variable APOS gives the motor position. When encoder feedback is used, APOS is measured in encoder counts (1 encoder count = 1 bit). The scaling factor is:

$$\text{Motor position [revolutions]} = \frac{1}{4 \times N \text{ [lines]}} \times \text{APOS [bits]}$$

where N is the number of encoder lines

4 is the multiplication ratio of the position resolution done in the encoder interface.

10. Available Memory Areas

The drive has 2 types of memory: a 1.5K×16 SRAM (internal) memory and an 8K×16 serial E²ROM (external) memory.

The SRAM memory is mapped both in the program space (from 8200h to 87FFh) and in the data space (from A00h to FFFh). The data memory can be used for real-time data acquisition and to temporarily save variables during a TML program execution. The program space can be used to download and execute TML programs. It is the user's choice to decide how to split the 1.5-K SRAM into data and program memory.

The E²ROM is seen as 8K×16 program memory mapped in the address range 4000h to 5FBEh. It offers the possibility to keep TML programs in a Non-volatile memory. Read and write accesses to the E²ROM locations, as well as TML programs downloading and execution, are done from the user's point of view similarly to those in the SRAM program memory. The E²ROM SPI serial access is completely transparent to the user.

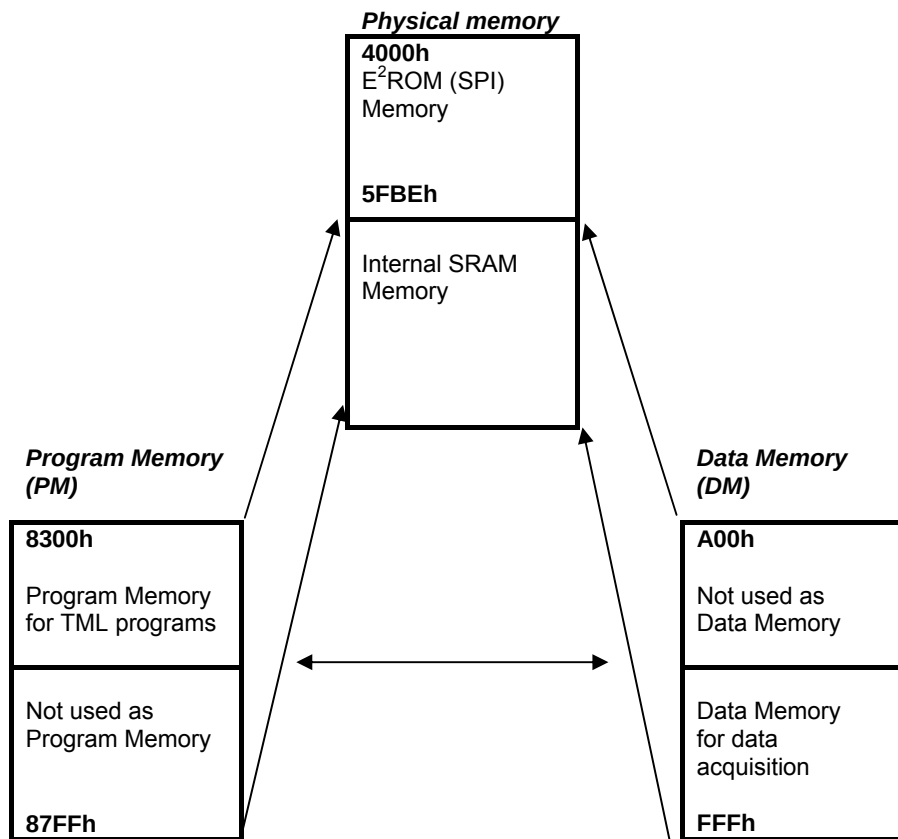


Figure 8.1. ISM4803 / ISM4803-CAN Memory Map

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